

School of Mathematical Sciences

PhD Studentship

Project title: Realisations of Graphs as Frameworks
Project area: Discrete Geometry and Graph Theory
Supervisor(s): Professor Bill Jackson
Start date: September 2012

Project details: Project details: Graphs with geometrical constraints provide natural models for a variety of applications, including computer-aided-design (CAD), sensor networks and flexibility in molecules. Given a graph and prescribed lengths for its edges, a basic problem is to determine whether it has a straight line realisation in Euclidean d -dimensional space with these given lengths. We refer to such a realisation as a framework. Given a framework, one may also ask whether it is unique, either globally, or with respect to local movement (rigidity). The rigidity question has a strong mathematical pedigree, going back to a conjecture of Euler that every 3-dimensional polyhedron is rigid. The existence, global uniqueness, and rigidity problems are known to be NP-hard. However, this hardness relies on algebraic relations between co-ordinates of vertices, and for practical purposes it is natural to study generic realisations. Laman gave a combinatorial characterization for the rigidity of generic 2-dimensional frameworks in 1970, and Jackson and Jordan subsequently characterized their global rigidity in 2005. No combinatorial characterizations for rigidity or global rigidity are known in higher dimensions. The project will consider these and related problems.

Suitable candidates: The successful candidate should have knowledge of graph theory and geometry. Familiarity with matroids would help but is not essential.

Funding details: The studentship is funded by EPSRC and will cover student fees and a tax-free stipend starting at 15,590 per annum and is available to candidates from the UK and EU.

Information about the School of Mathematical Sciences: The School of

Mathematical Sciences is one of the largest UK mathematical science departments and is one of five Schools in the Faculty of Science and Engineering at Queen Mary. The School offers energetic and diverse postgraduate activity across the spectrum of mathematical sciences from pure and applied mathematics to statistics. Our staff includes international leaders in many areas of mathematical research, and the School is a hive of activity, providing a vibrant postgraduate life. For more information about the School please see <http://www.maths.qmul.ac.uk/>

Contact: Informal enquiries can be made by email to Bill Jackson, b.jackson@qmul.ac.uk.

How to apply: To apply for this studentship and for entry on to the mathematics research programme please fill in online application form at <http://www.qmul.ac.uk/postgraduate/applyresearchdegrees/index.html>
If you have any queries regarding the application process please contact the postgraduate administrative officer (maths-pg@qmul.ac.uk / +44 (0)20 7882 5454).

Application deadline: Deadline for applications is 31st January 2012.